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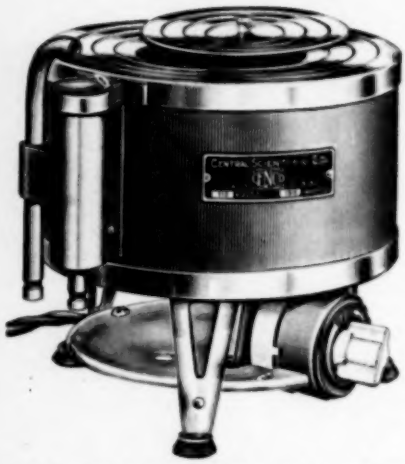
A Small Electrically Heated Water Bath



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Total volume of container	2000 cc
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Storage System for Seed and Hulls Affords Many Economies

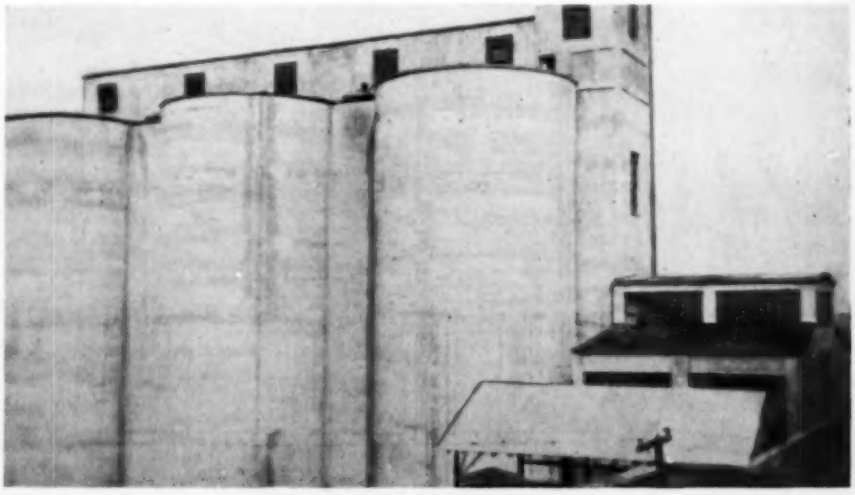
Minimum Power and Space Requirements in Plan Copied from Grain Elevator Methods

ONE of the largest oil mills in the United States is the Pine Bluff Cotton Oil Mill, located at Pine Bluff, Ark. F. H. Moulton, Jr., is manager.

This mill is equipped with the same system for storing seeds and hulls as is in use in the mill of the New South Oil Co., Helena, Ark. It consists of a series of concrete, cylindrical tanks similar to those used for storing grain. And like grain storage tanks, they are fitted up with conveyers and elevators built into a concrete structure adjoining.

The system of transferring seed is very complete, it being possible to move seed from one tank to another at the same time seed is being taken from the cars or sent into the mill. Flexibility is perhaps the word to describe the entire system. To work the seed out of the tanks, each tank is equipped with a small conveyer at the bottom. These conveyers are so arranged that they can be operated one at a time by a small electric tank motor which is pushed by manpower from one tank to the other. This means great economy of power.

The most notable feature of the system is the arrangement for controlling the temperature of the seed, which is done by a Zeleny Thermometer System. This consists of thermocouples in each tank connected by means of flexible cables to an indicating apparatus in the office. There are 8 tanks



Pine Bluff (Arkansas) Cotton Oil Mill

and 24 stations in each tank. By making suitable connection on the switchboard, the temperature at each station is instantly indicated. The tanks are 92 ft. high x 32 ft. diameter with 8 in. walls and are built of reinforced concrete. The great advantage they afford is the large amount of storage room obtained on very small land area. Mr. Moulton, who has used these tanks both at Helena and Pine Bluff, expressed himself as very well pleased with the system.

Housekeeping in the Oil Mill

From An Address

By J. P. Dickinson, Superintendent, De Soto Oil Co.

THIS subject has become one of the most important in the cottonseed oil-mill industry. The cottonseed oil-mills have not been a profitable risk for the insurance company throughout the country, so it is now up to the individual mills to put their houses in order or carry their own insurance. There are many things the superintendent can do to help along the line of better housekeeping, for instance; he can get an air gun that will clean the lint down from the walls, ceiling, running boards, hangers, bearings, etc., then have all this swept up and taken out. This is an endless job. Some mills, in fact, most of them, will make a deposit of dirt and lint from 1 inch to 2 inches thick in 24 hours. Therefore, it is very essential to watch this very carefully. Do not allow dirt, trash, or their substance to be swept up in corners or in out of way places and left there, but have everything put out in plain view so it will be taken out.

Another thing that is very objectionable is the throwing of oily waste, cotton sacks, papers, rags, etc., in the corners or on the floors around the mill. There should be someone to see to this each day; if looked after each day it does not take much time. Another menace is meal dust around the cake grinding room. This also should be taken care of each day. All holes in brick walls or partitions should be closed up and all fire doors should be gone over once a week and tested to see if they work properly. Where there are water barrels and buckets, they should be inspected regularly once a week or oftener and kept full of water and in place. Fire extinguishers should be properly located, one to every 200 square feet of floor space in lint room, separating rooms, and cake grinding rooms. They should be refilled every 12 months.

If there is a sprinkler system in your mill, it is very essential to see that it is in working condition at all times and properly protected to prevent from freezing in cold weather for your sprinkler system is of no value if frozen up. All of the above takes some personal attention on the part of someone. In the average eight-press mill and smaller, it usually falls on the superintendent to look after these details. In larger mills a special man looks after this work.

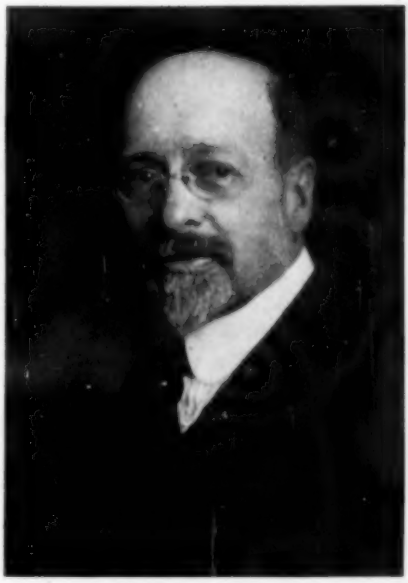
There are some systems in use that eliminate practically all lint and dirt from the lint rooms. This will cost the mills about $300.00 a linter, but in my opinion it should be compulsory for the mills to put in something to eliminate this dust and dirt for the sake of the men who work in the linter rooms.

Cottonseed As the Answer to the Economic Problem of the South

By DAVID WESSON

If the Southern Farmer Utilized His Cottonseed Properly He Could Achieve Financial Independence

David Wesson, dean of the cotton oil industry, has just completed a lecture tour of the South in the interests of the Interstate Cottonseed Crushers Association. Although his speeches were addressed to young people, and to many who never even had seen an oil mill, they are equally instructive to the most seasoned veteran in the business. The South has been a slave to King Cotton for generations. Dr. Wesson shows how this great section of the country can win through to economic independence. And every man engaged in the cotton oil industry can do incalculable benefit to his business and the business of the entire Southland by preaching and reiterating, time and again, the gospel of these pages to the younger generation, in whose hands lie the destinies of tomorrow.



David Wesson

IT seems rather strange for a Yankee from New Jersey to come down here in Dixie and tell you young people about one of your biggest industries. Maybe it is not as strange as it seems. All of you who have ever been in a cotton oil mill, please raise your hands. Well, I see by the number of hands that go up that not one-fourth of you have ever seen an oil mill in operation, so it looks as if I may be able to tell most of you something after all that you do not already know.

You probably do not know that the cottonseed is one of the greatest sources of wealth in the South because the Southern farmer raises mostly cotton and the value of the seed is about one-sixth of that of the entire crop. Slavery was supposed to have been abolished about 1864; but right here I want to say that the Southern farmer has been in slavery ever since. His master is King Cotton. The Southern farmer ought to be free and independent. He could raise all his own meat, fruit and vegetables. And whether the cotton crop be a failure, or a success, he would be bound to have enough to live on and be independent. If he uses the

cottonseed and its products rightly, he can achieve this end. It is to you young people, to whom the future prosperity of this country will soon be entrusted, that I wish to explain how this may be largely accomplished by the proper use of the cottonseed.

I was talking with an old gentleman in Pine Bluff a few days ago, who told me that when he was a boy he used to work off his surplus energy playing on the big pile of cottonseed at his father's gin, and how his father used to pay a man $1.50 a load for hauling the surplus seed and dumping it into the creek. It has not been so many years ago that there was a law on the statute books of Mississsippi prohibiting dumping cottonseed into the water courses because it killed fish and spoiled the water for drinking.

When I first traveled South, about 1886, cottonseed could be bought for $8.00 a ton at the mills. The farmer would not take $6.00 because it cost that to haul it. Today it is selling for $30.00 or more and during the war it was worth $75.00 and better. The reason for this great advance in the value of the seed has been largely the work of the chemists who have found means of utilizing the oil contained in this marvelous and once despised by-product.

The first oil mill in this country, so far as I know, was at Columbia, S. C., when the oil was used for burning in lamps and for paint. There were a few primitive oil mills in this country about the time of the war between the States. In 1870 less than 100,000 tons of seed were crushed. This year there will probably be a crush of between five and six million tons. This will give you a good idea of how the industry has grown.

Let us first consider the seed itself. This is only a little nut, the shell of which is very much like that of a chestnut covered with short fuzzy fibre. In our Western Country these are white, the same as the cotton; but in the East we have seed of as many colors as Joseph's coat—some white, some green, some red. Some have no fibres at all; they are called bald headed seed. Roughly speaking, the seed contains about 55 parts of meat and 45 parts of hulls. The meats, of course, are the valuable part of the seed. They contain between 32 and 38 per cent oil, according to the locality where they are grown, and are very rich in protein.

I think, perhaps, you will best understand how the seed is utilized if I tell you what is done to them in the mill. When the seed is received at the mill they first have to be cleaned to remove the sand, bolls and trash which they contain. The mill man buys seed to get out the meat, which is the valuable part. Of course, if the gin owner puts sand, trash, and other foreign material into the seed which he ships, he is sending something for which no mill owner can afford to pay, and Mr. Gin Man is going to lose not only the weight of the trash, which he ships to the mill, but he will have to be charged the freight on it—which is, of course, bad business. Cottonseed is almost as valuable as wheat and the laws of the country consider cottonseed as a food product. Cottonseed shipped in Interstate Commerce is liable to seizure by the United States Government, if it is found adulterated with foreign matter.

Clean seed next go through machines called linters which separate the fibre from the seed. This short

fibre is known as linters. It is used for upholstery, stuffing of mattresses, absorbent cotton, fabrics, Rayon, artificial silk, nitrocellulose (used in making gun cotton and smokeless powders), varnishes, lacquers, etc. The mills are now getting about 75 pounds of this lint per ton of seed. The early mills did not attempt to save this lint, and when they put in machines to save it, they only took off 20 to 25 pounds per ton.

The linted seed next goes to the hullers where the seeds are chopped up. Then they pass to the separating machinery, consisting of shaking sieves and revolving reels covered with fine wire screen, which separates the meats from the hulls. The meats then go to the press room where they are cooked in large steam jacketed kettles and afterwards formed into the cakes between press cloth and put in heavy hydraulic presses which squeeze out the oil. The oil is settled and then shipped to the refineries in tank cars.

The hulls which are separated from the seed are used as cattle feed and have about the same value as a low grade hay. They are better than oat straw, which is often used for feeding. The cottonseed cake which comes from the presses is about as hard as boards and is about 30 inches long by 13 inches wide. It next goes to the cake mill where it is ground up into a golden yellow meal and sold for cattle food and fertilizer. This meal is one of the most valuable foodstuffs we have. It contains more protein than any material within the reach of the cattle feeder. The next thing to it is linseed meal which only contains about 2/3 as much protein. The great popularity of linseed meal in times past, makes it sell at a higher price than cottonseed meal, though it is only worth 2/3 as much. This is largely due to propaganda and superstition among the feeders. As you doubtless know, protein is the most valuable and at the same time highest priced constituent of our food. Beef is a protein food and if we pay forty cents a pound for a beefsteak, we pay $2.00 a pound for the protein it contains. Cottonseed meal at the present price of about $30.00 per ton furnishes protein for four cents per pound. Cottonseed protein is almost as valuable as beef protein for promoting the growth of animals.

It can be prepared in such a way as to be useful for human food and can be used as meat substitute. This has been done in a laboratory on a fairly large scale, and specially prepared cottonseed meats have been served in the form of hash, croquets, sausage, sandwich filling, meat loaf, etc., and highly relished by Government chemists, oil mill chemists, Rotary Clubs, and last but not least Womens' Clubs, when they were served in the form of sandwiches, and were cleaned up completely.

Because cottonseed meal is such a highly concentrated food, containing as it does 43 per cent protein, it should be fed judiciously—if a little of a good thing is good, it does not necessarily follow that more of it is better. Cheese is perhaps one of our most concentrated foods; but you all know that cheese fed in too large quantities will make anybody ill. If you do not believe it, try it and see how soon you will need a doctor. Common salt is a necessary article of diet; but if any of you should take a table spoonful at once, you would think you had been poisoned, as in fact

you would be. In the same manner a good many ill effects have been reported from feeding cottonseed meal to animals because it has been fed in too large quantities. Again in times past, cottonseed meal made from damaged seed has been fed and bad results followed just the same as they are liable to follow in feeding any kind of damaged material.

The Agricultural Experiment stations of the country have done a great deal of work to find out how much cottonseed meal can be fed profitably to farm animals. It has been found that the average dairy cow can safely use 3 pounds a day without any inconvenience. When cottonseed meal and hulls are fed together 4 pounds of cottonseed meal can be fed to 17 or 18 pounds of hulls. It is wise, however, not to feed the full ration of meal at first. It should be fed gradually, increasing the quantity until it goes up to about four pounds per animal, which is enough to balance the ration properly. At the North Carolina Experiment Station, Dr. Curtis has found that by feeding plenty of green fodder along with the meal, cows and heifers can safely eat as much as from 11 to 13 pounds of cottonseed meal per day and thrive on it. At the Texas Experiment Station, College Station, Texas, hogs are regularly fed 15 per cent cottonseed meal in their ration. I never saw finer hogs anywhere. An interesting experiment was made to show the value of cottonseed meal. Four pigs were fed on a ration consisting mostly of corn and four other pigs were fed on the same ration, to which 15 per cent cottonseed meal had been added. At the end of the feeding period, the four pigs fed on corn weighed 63 pounds each, while those receiving cottonseed meal weighed 160 pounds each. This is a beautiful illustration of the necessity of balanced rations for growing animals and also the effectiveness of cottonseed meal.

I now want to tell you something of the oil. In the early days the oil went to the refineries where it was agitated with caustic soda, which caused the soap stock to drop to the bottom, leaving a light yellow oil above it. This yellow oil was shipped in large quantities to Europe, where it was eaten largely as an olive oil, or substitute therefor. Much of it came back to this country where it was sold in bottles labeled olive oil, and some of it was also marked as cooking oil and used for frying and for salads. Unfortunately little discrimination was made in the quality of the oil which was thus sold and used and cottonseed oil acquired a very bad reputation. About 1878 cottonseed oil began to go to Chicago in considerable quantities, where it found its way into lard. Enough tallow or lard stearine was added to maintain the proper hardness. This matter was investigated by Congress with the idea of imposing on these adulterated lards a tax similar to the oleomargarine tax, which has done so much to deprive this country of a wholesome food product. Investigations went into the very vitals of the packing houses, where it was found that if there was any choice it was with the product containing the wholesome vegetable oil, and the investigation came to an abrupt end with the manufacturers of the adulterated lard (which used to be sold under the name of pure lard) agreeing to label their product "compound lard," under which name it has

been sold ever since. The lard compounds made at that time did not have a first class flavor, owing to the fact that the oil used was not deoderized. The first deoderized process was brought out by Henry Eckstin of Chicago about 1893. It produced an oil very much better than any which had been used up to that time. In 1900 an oil was on the market which was odorless and tasteless and which revolutionized the use of cottonseed oil. It is well known under a name which modesty prevents me mentioning. Some of these are known as Snowdrift, Crisco, Scoco, etc. On account of this improvement, greatly increased quantities of cottonseed have been worked in the mills and the Southern farmer has received constantly increasing prices for what used to be a waste material.

In order to make the oil into a satisfactory lard substitute or shortening, hardening of some sort had to be used. In the early days of the industry, pressed beef fat was used with the oil and the melted mixture chilled by rapidly running over refrigeration rolls. Market conditions raised the price of this material to a prohibitive extent and it was about that time it was discovered that by passing hydrogen gas into heated oil in the presence of finely pounded nickel that the oil was rendered into a very hard fat. The nickel was removed by filtration and used over and over again. Its action was due to what chemists call catalysis. And the prepared nickel is called catalyser. Just how a catalyser works, we do not know; but it brings about action merely by its presence. Perhaps this can be best realized by the story of the Italian standing by his peanut stand. Nearby on the corner a young man jingles nickels in his pocket. Nothing happens until a pretty girl comes along and smiles in the direction of the young man. He in order to show off, buys a bag of peanuts. The young lady passes on without taking any part in the transaction, which she has brought about by her mere presence. Therefore, she was a catalyser. Perhaps she was catty and her name may have been Eliza.

Cottonseed oil sold under one name or another is now used in almost every household in our land, either in the form of salad oil, lard substitute, or prepared salad dressing. A chart which I am showing on the screen, shows the relative digestibility of fats and oils. You will see there is no choice between cottonseed oil, olive oil and corn oil. You notice, however, that while cottonseed oil has a digestibility of 98 per cent, chocolate is about 95 per cent digestible. So, if you young men want to keep your sweethearts happy and healthy, do not feed them chocolates, but feed them cottonseed oil.

The International Vegetable Oil Company, announces that Alfred Monsalvatge, for some years manager of the company's crude mill and refinery at Savannah, Ga., has been appointed general mechanical superintendent of the company for all its mills and refineries. Mr. Monsalvatge will continue to reside in Savannah, and have direct charge of the refinery there.

T. E. Allen, formerly secretary of the company, when its headquarters were in Atlanta, becomes manager of the Savannah mill and assistant manager of the refinery.

New Plant for Laurel Soap Manufacturing Co.

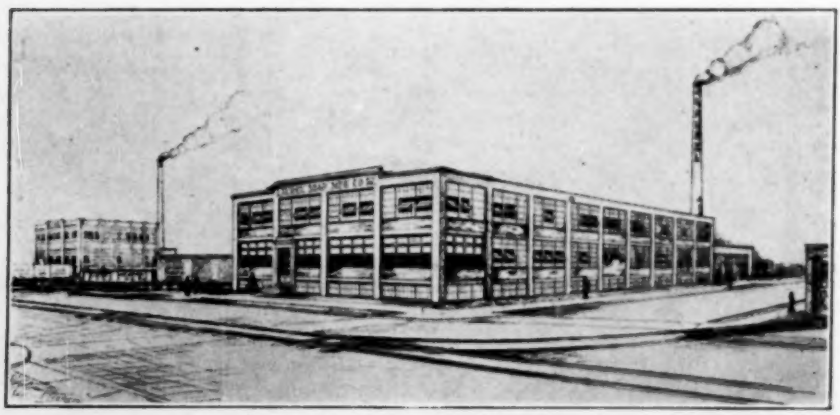
The new building for the Laurel Soap Manufacturing Company now in process of construction, is to be located at the southeast corner of Almond and Tioga Streets, Philadelphia. The entire building will be of reinforced concrete and will have a frontage of 80 ft. on Tioga Street, and a depth of 180 ft. on Almond Street. It will consist of two stories and a basement. In the rear of the manufacturing plant and directly adjacent to it are a three-truck garage, boiler room and steaming-out room for steaming oils from drums. This portion of the building is 30 ft. x 80 ft., with a 90 ft. radial brick chimney in connection with the boiler room.

The plant is provided with a railroad siding and a loading platform on the east side which takes in about two-thirds of the length of the building. The large soap boilers, which will increase the present capacity of this concern considerably, are located in the rear of the building directly adjoining the boiler room. The pumping machinery and light storage of fats, oils, caustic, potash, etc., are in the basement but remote control switches to all pumping machinery allows these materials to be delivered to any part of the building without the attendant being near the pumps.

The general offices and the laboratory extend across the full front of the building on the Tioga Street side. The plant is so designed that extensions can be made.

This concern has enjoyed a steady and substantial growth since its organization. It makes a specialty of textile soaps and oil for the entire industry, having many individual products of its own origin. The project now under way marks an important step forward in the history of this organization.

The new building was designed and is being erected by the John N. Gill Construction Company, Philadelphia.



New Plant of Laurel Soap Manufacturing Company in Philadelphia

Orange and Lemon Oil By-Products Bring Prosperity to Citrus Fruit Growers

One Plant Alone Nets $100,000 from Cull Oranges Formerly of Little Value

CITRUS growers in California continue to develop facilities for utilizing cull oranges and lemons. A few weeks ago a new plant for recovering usable substances from oranges was formally opened at Ontario, Calif., according to reports received by the United States Department of Agriculture.

A dozen years ago great quantities of oranges and lemons not only were discarded as cull fruit, but had to be hauled away at a cost of at least $1 a ton. To-day practically all of this sub-standard fruit is being utilized in numerous ways, returning to the growers an average of $12 or more a ton.

The remarkable growth of the citrus by-products industry which has been developed within the last decade is founded on results of scientific research. Investigations begun about 12 years ago by the Bureau of Chemistry, United States Department of Agriculture, in its branch laboratory at Los Angeles, have resulted in the development of processes for recovering citric acid, as well as other valuable substances such as oil, pectin, juice and pulp, from oranges and lemons. The commercial application of these processes not only enables the industry to save the fruit that is for one reason or another undesirable for market, but to use marketable fruit at a profit when there is a surplus. It is estimated that 30 per cent of the annual production is classed as culls, and the prosperity of the citrus growers depends upon a profitable utilization of this unmarketable fruit.

By means of an improved machine to press the oil from orange and lemon peel developed during the past year, at least 5 pounds of oil can be pressed from the peels of a ton of lemons. One concern in Los Angeles uses 60 tons of citrus fruit a day in making juice by means of a revolving burr-type machine. As citrus oils are worth approximately $2.50 a pound the extraction and utilization of the oil would mean an additional return of $12.50 for each ton of cull fruit, or on the output of this one plant, a gross additional income of $750 a day. More work must be done to perfect the machine, however, before it can be commercially applied.

It is believed that the research work now underway will enable California manufacturing concerns to utilize these oils from orange and lemon peel for all purposes for which European oils now are used.

It has been found in this and other countries that the basic research necessary for many lines of endeavor is generally a problem for the Government to work out. Returns from such fundamental study are often so long delayed that it can not well be done by individuals or concerns who ordinarily expect a profitable income from their investment within a short time. Investigations and experimental study to aid in perfecting methods of utilizing waste products of agri-

culture is one of the most effective ways in which the Bureau of Chemistry can serve the agriculture and manufacturing industries of the country. The citrus by-products industry is a conspicuous example of the commercial application of fundamental research.

Citrus growers themselves are now operating two by-products plants, one for lemons at Corona, Calif., and the one for oranges at Ontario, Calif. Commercial concerns are now manufacturing on a profitable scale numerous marketable products from large quantities of cull fruit that would otherwise be a loss to the industry.

One plant operating on cull lemons last year produced about 65,000 pounds of lemon oil with a value of approximately $70,000, as well as 30,000 pounds of pectin.

From waste oranges are manufactured juice, marmalade, pectin, orange oil, and other products. One plant, which used last year 10,000 tons of oranges, put out, among other products, about 50,000 pounds of orange oil having a wholesale value of approximately $100,000.

The research laboratory at Los Angeles made considerable progress last year in studies to determine the exact chemical differences between the oils made from California fruit and those made from European oranges and lemons. The results of this investigation should show the relative values of the oils for certain uses, such as the manufacture of ice creams, hard candies, cake icings, perfumery and beverages.

CELLULOSE SAUSAGE CASINGS

To join the ranks of chemical wonders there now comes the artificial sausage casing, made from material that is first cousin to rayon. Cellulose sausage casings are the outcome of several years of research on the part of William F. Henderson and Harold E. Dietrich at the Mellon Institute for Industrial Research. Animals furnish the coverings for sausages as we have always known them. The source of supply has been more or less irregular, while the expense of hand labor and difficulties of handling and cleaning, particularly the latter, have made a satisfactory artificial casing extremely desirable. The fibres of cotton seeds, treated with chemicals as in the viscose process, are the source material of the new product. Machinery has been developed at the Mellon Institute which has demonstrated that thin, semi-transparent tubes can be turned out in lengths and sizes to fit any sausage or wiener at a moderate price. They are used dry and will keep any length of time—an advantage not possessed by the animal variety—and can be stuffed with sausage "makings" much more rapidly than the old ones. The inventors declare that "the sausages packed in cellulose containers are perfectly comestible and may be cooked in any manner and eaten with no difficulty."—*Current History.*

VEGETABLE OILS PLANT FOR CALEXICO

W. J. Hartman, cotton grower of Calexico, Calif., has purchased the old Southwest plant in that city and is installing machinery for the manufacture of oil from flax seed, soya beans, sesame, cotton seed and copra.

The Purpose and Use of Filter Aids

By F. L. HORINE

A Discussion of Diatomaceous Silica and Its Use in Filtration

IN connection with the production and refining of vegetable, animal, and marine oils, many operators, especially the larger ones, carry out one or more types of filtrations. By filtration we mean the separation of solids from liquids through filter fabrics. We will not consider this separation as carried out by such other means as settling, the use of centrifuges or centrifugals, etc. The term filtration is sometimes erroneously employed to describe a decolorization process. Whereas an already clear oil is allowed to percolate through a bed of fuller's earth it cannot be called a filtration as no suspended solids are removed from the oil.

To force the liquid through a filter fabric requires pressure. This pressure may be supplied by gravity (utilizing the hydrostatic head of the mixture) but pumps are usually employed. Filters utilizing atmospheric pressure by creating a vacuum on the filtrate side of the filter medium are not usual in the oil industry.

Gravity filters are ordinarily bag shaped and are only economical where a material is very free flowing and leaves a slight cake. They make for poor working conditions, entail a high labor expense and are rapidly going out of use.

The usual filters employed in oil work are the flush plate and frame filter and the recessed plate filter. These are alike in character. The recessed plate filter has a much smaller cake space and can be run only on short cycles unless very little cake is formed. In such equipment the mixture is introduced into a chamber under pressure and the liquid passes through the cloths covering the plates, the suspended solids remaining upon the face of the cloth.

In order to filter a liquid which contains suspended matter of a slimy nature it is necessary to pass this liquid through a porous membrane with openings of capillary size. These openings must be sufficiently small to retain the gummy and colloidal particles and large enough so that the clarified liquid will pass through. The filter cloth screen against which the liquid is forced has openings of various definite sizes, as for instance 400 openings per square inch. Particles of the suspended matter which are smaller than these openings will therefore pass through while the larger particles will be retained upon the surface of the cloth. If sufficient gummy material is in suspension the surface of the cloth will soon become blocked up and smeared with a fine layer of slime. Eventually no liquid at all will pass through. The liquid which has been passed through on the short filtration time will have been clarified only to the extent to which particles larger in size than the screen openings have been retained.

Most filtrations in the various oil industries have to do with the removal of a slimy natured suspended solid. The object of this

article is to deal primarily with the philosophy underlying filtration in general rather than with the results of filtering at any given point. But here can be listed a number of points at which filtration is or could be employed to advantage.

(1) The filtration of raw oils of any type which are not to be immediately refined. Proper filtration removes practically all of the agents which cause deterioration in storage. These include gummy and colloidal meal and other matter and traces of moisture.

(2) Filtration before bleaching on some dirty oils.

(3) Filtration after bleaching to remove decolorizing media.

(4) Filtration after hardening to completely remove catalyst.

(5) Final clarification or polish filtration just before filling final packages.

Just before mentioning the above list we remarked that filtering a liquid containing slimy suspended matter through cloth gave a short time cycle on the filter and, often, a poor degree of clarification. This inexcusable condition actually exists at a number of filter stations and this in spite of the fact that a remedy is at hand. It is true that such preliminary treatments as chilling, heating, acidity and alkalinity control, etc., do put some liquids in a proper condition to filter, but these do not always change the slimy nature of the suspended matter.

A large number of the more progressive operators have adopted the use of diatomaceous silica as a filter aid. A filter aid is a material inert chemically to both the liquid and the suspended matter, but which, when well stirred in powder form into the mixture, facilitates filtration. The ways in which the filtration will be helped will be discussed as soon as we note the properties to be desired in a filter aid. These are

(1) It should be insoluble and chemically inert.

(2) The particle should be rigid.

(3) The particle should be highly porous and expose a large surface area.

(4) It should be light in weight and remain well in suspension.

(5) It should be reasonable in price.

(6) It should be in a form easy to use.

(7) A uniform supply should be obtainable.

Now consider the action and advantages of a properly processed diatomaceous silica filter aid. The amount to be added is based upon the proportion of slimy matter to be removed and will usually be approximately four times the weight of this slimy solid suspended matter. This averages about one tenth of one per cent of the total weight of the liquid. The filter aid is then thoroughly mixed with the liquid to be filtered and this liquid is pumped against the cloth in the usual way. As the liquid starts through the filter press a film of the filter aid forms on the surface of the filter fabric or screen. If the proper quantity of filter aid has been added the film will consist almost entirely of the filter aid so that all of the slimy and colloidal particles are trapped and held back by the cellular filter aid particles. The clarified liquid will pass through the channels formed by the criss-cross building up process of the filter aid particles against the filter cloth or screen. As the liquid continues to trickle through this screen of filter aid particles a cake is gradually built

up which constantly presents a new face and which consists principally of the filter aid particles intermixed with the entrapped impurities which have been removed from the liquid.

Filtering in this manner confers a large number of advantages upon the operator. These are so numerous as to require listing.

(1) Cloths are protected from becoming impregnated with the slimy solids removed and therefore a much longer life, with less frequent washings, is obtained. Thinner and cheaper cloths can be used, as filtration is really controlled by the filter aid.

(2) Longer filtration cycles result.

(3) Much higher rates of flow are possible.

(4) There is considerable labor saving as the presses do not have to be cleaned so often.

(5) A new installation requires less filter equipment and a present installation is greatly increased in capacity.

(6) Saving in yield as presses do not have to be cleaned so often.

(7) A perfectly clarified filtrate is obtained.

It is difficult to conceive a filter aid not being used where a filter aid of the type described is employed and undoubtedly there are many places today where a suitable filter aid would be a source of gratification to the user.

NEW OIL MILL WILL BE BUILT

Anderson, Clayton & Company, of Houston, will begin construction about March 1, of a new six-press cotton oil mill at Lockney, Tex., under the supervision of J. Campbell Jones, vice-president and general manager, who has put the new A. C. & Co. mill into successful operation during the past season at Abilene. Lockney is in the Pan-Handle, in Floyd County, about 20 miles east of Plainview on a branch of the Santa Fe railroad.

INTERSTATE CONVENTION DATE FIXED

The Interstate Cottonseed Crushers Association have fixed upon New Orleans as the location for their annual spring meeting, which will be held at the Hotel Roosevelt, May eleventh, twelfth and thirteenth. While the committee of the American Oil Chemists Society have not at this writing met to decide upon their convention location, it is probable that the society will hold its meeting at the same place on Monday and Tuesday, May 9 and 10.

PROPOSED LEGISLATION IN ARKANSAS

A bill has been introduced in the Arkansas General Assembly by Representative Shaver of Cross County, to make it unlawful for corporations or persons operating or having any financial interests in cotton oil mills or cotton compresses from operating or holding any stock or interest in any cotton gin. Exceptions are made of ginneries of not exceeding 600 saws, which may be operated or owned by mills or compresses if located in the same town or city, but such ginneries must not be operated "for the purpose of destroying the gin business." Another clause of the bill would make it permissible for the owner or operator of a gin plant, ginning for himself and his tenants, but not for the public, to own stock or be a director of an oil mill or compress.

Chemical Industries Exposition

Date Has Been Set for September 26 at Grand Central Palace, New York

THE date for the annual Chemical Industries Exposition has been fixed as of September 26 to October 1 inclusive, at the Grand Central Palace, New York City. In making this announcement, the Advisory Committee also states that three floors of the Exposition Building already have been reserved.

One of the interesting features of the Exhibit is the Student's Course, which will be conducted throughout the entire week in two sections. The first is an elementary group and the second an advanced group. Students attending these courses come from every industry and every walk in life. Speakers at the Students' Course will comprise many men of note in the field of Chemical Industry.

Prominent among the features will be the various geographical exhibits divided as follows:—The Southern Section by States and railroads to show the raw materials and opportunities of the Southern States. The Canadian Section by Provinces and railroads to show the raw materials of Canada suitable for industrial development. The Container Section, exhibiting containers used in industry with the machinery for packaging, bottling, and labeling; and a Laboratory Supply and Equipment Section. The sectional exhibits will be supplemented by displays of chemical products, machinery used in manufacture and development, dyes and fine chemicals, as well as instruments of precision, unit processes developed and in operation.

One of the features, the date for which was decided by the Advisory Committee is the designation of Wednesday evening, September 27, as the date for the American Chemical Banquet.

Many new features are being planned for this coming Exposition. One of interest is the change in policy which will admit exhibits of foreign manufacture for showing in the Exposition. This change has been made because the American Chemical Industries are now in such a position that exhibits of foreign products would prove stimulating and at the same time give American manufacturers an opportunity to see what European manufacturers are doing.

Inasmuch as the interest lies in Industry as a whole, all classes of foreign exhibits rather than one particular type are desired, such as displays by manufacturers and producers of the newer synthetics, dyes, solvents, pharmaceuticals, chemicals, and chemical products for direct use in the arts and industries; laboratory supplies and apparatus, instruments of precision and control. To this can be added chemical and engineering equipment for plants and factories, which is of decided interest and great importance to both manufacturer and consumer.

The opening of the doors of the Exposition to foreign manufacturers in the chemical, metallurgical and numerous industries is the first opportunity for foreign displays in America at an exposition designed for the consumer.

Department of Commerce Census Shows Industry's Production

Fish Oil Shows Greatest Increase Over Corresponding Period Last Year. Corn and Lard Off.

THE Department of Commerce announces that the factory production of fats and oils (exclusive of refined oils and derivatives) during the three-month period ended December 31, 1926, was as follows: Vegetable oils, 1,165,895,148 pounds; fish oils, 24,080,433 pounds; animal fats, 499,116,767 pounds; and grease, 95,066,473 pounds; a total of 1,784,158,826 pounds. Of the several kinds of fats and oils covered by this inquiry, the greatest production, 851,637,570 pounds, appears for cottonseed oil. Next in order is lard with 372,447,996 pounds; linseed oil with 206,496,045 pounds; tallow with 123,974,727 pounds; coconut oil with 64,570,430 pounds and corn oil with 27,854,486 pounds.

The production of refined oils during the period was as follows: Cottonseed 679,873,670 pounds; coconut, 59,020,026 pounds; peanut, 1,605,631 pounds; corn, 19,487,216 pounds; soya-bean, 577,110 pounds; and palm-kernel, 65,781 pounds. The quantity of crude oil used in the production of each of these refined oils is included in the figures of crude consumed.

PRODUCTION, CONSUMPTION, AND STOCKS OF FATS AND OILS

(In some cases, where products were made by a continuous process, the intermediate products were not reported.)

Kind	Factory operations for the quarter ending Dec. 31, 1926		Factory and Warehouse stocks Dec. 31, 1926
	Production (pounds)	Consumption (pounds)	(pounds)
VEGETABLE OILS			
Cottonseed, crude	851,637,570	740,570,066	155,455,120
Cottonseed, refined	679,873,670	353,167,749	332,343,692
Peanut, virgin and crude	2,717,791	2,246,605	1,815,826
Peanut, refined	1,605,631	1,947,731	464,515
Coconut, or copra, crude	64,570,430	124,099,274	84,536,689
Coconut, or copra, refined	59,020,026	51,840,995	14,820,574
Corn, crude	27,854,486	28,431,625	8,165,906
Corn, refined	19,487,216	2,494,112	10,765,970
Soya-bean, crude	734,703	2,717,483	5,832,217
Soya-bean, refined	577,110	969,879	1,774,478
Olive, edible	350,024	418,089	3,648,272
Olive, inedible	.....	1,561,466	2,580,746
Sulphur oil, or olive foots	.....	8,846,214	5,190,543
Palm-kernel, crude	.....	4,170,632	340,068
Palm-kernel, refined	65,781	43,294	44,671
Rapeseed	900	3,591,104	5,113,570
Linseed	206,496,045	102,617,796	174,098,444
Chinese wood or tung	.....	21,107,009	18,059,125
Chinese vegetable tallow	.....	815,172	1,233,269
Castor	11,352,933	4,577,897	6,367,420
Palm	.....	30,133,681	18,003,991
All other	180,266	3,126,330	5,362,352

FISH OILS:[1]			
Cod and cod-liver	414,428	4,573,784	9,164,088
Menhaden	15,605,194	9,029,721	26,095,451
Whale	1,915,418	7,577,216	33,794,474
Herring, including sardine	5,764,372	9,203,176	14,924,589
Sperm	.....	338,814	2,330,031
All other (including marine animal)	381,021	3,940,678	1,045,885
ANIMAL FATS:			
Lard, neutral	9,753,574	6,300,330	2,544,196
Lard, other edible	362,694,422	3,259,152	49,009,722
Tallow, edible	15,120,795	11,591,128	4,478,049
Tallow, inedible	108,853,932	130,759,922	85,010,877
Neat's-foot oil	2,694,044	2,110,325	1,831,788
GREASES:			
White	16,987,901	5,091,172	5,995,161
Yellow	17,722,809	13,259,841	10,061,238
Brown	11,825,592	9,826,354	6,074,433
Bone	6,014,043	436,803	3,626,405
Tankage	13,925,256	1,013,514	4,685,618
Garbage or house	22,196,723	21,003,395	12,391,727
Wool	1,955,796	1,459,266	2,870,488
Recovered	891,736	534,711	1,131,208
All other	3,546,622	1,224,123	3,154,886
OTHER PRODUCTS:			
Lard compounds and other lard substitutes	338,893,858	353,875	22,926,118
Hydrogenated oils	131,040,779	122,130,739	11,226,981
Stearin, vegetable	4,330,001	4,872,769	2,544,512
Stearin, animal, edible	20,646,738	14,062,236	5,888,794
Stearin, animal, inedible	4,704,464	5,177,114	4,316,273
Oleo oil	37,995,760	13,901,845	15,701,698
Lard oil	7,283,057	5,618,931	5,601,621
Tallow oil	3,639,702	2,366,711	2,567,497
Fatty acids	41,154,727	52,454,546	5,604,436
Fatty acids, distilled	14,194,954	15,599,458	3,977,533
Red oil	12,314,670	5,453,425	6,765,609
Stearic acid	8,513,441	2,997,870	4,286,934
Glycerin, crude, 80% basis	31,974,100	35,516,183	9,452,465
Glycerin, dynamite	14,420,392	9,460,719	8,654,341
Glycerin, chemically pure	16,182,175	1,429,843	5,346,396
Cottonseed foots, 50% basis	99,041,536	58,278,554	61,322,477
Cottonseed foots, distilled	50,249,556	50,919,285	5,858,702
Other vegetable oil foots	15,544,666	13,810,071	5,633,797
Other vegetable oil foots, distilled	400,089	554,686	539,609
Acidulated soap stock	19,740,418	28,264,949	16,933,960
Miscellaneous soap stock	1,121,892	1,259,243	311,997

[1] The data of oils produced, consumed and on hand by fish oil producers and fish canners were collected by the Bureau of Fisheries.

IMPORTS OF OIL SEEDS, QUARTER ENDED DEC. 31, 1926

Kind	Tons	Kind	Tons
Cottonseed	8,447	Poppy seed	1,479
Castor beans	12,339	Perilla and sesame seed	430
Copra	61,622	Other oil seeds	2,392
Flaxseed	187,875		

RAW MATERIALS USED IN THE MANUFACTURE OF VEGETABLE OILS

Kind	Tons of 2,000 pounds: Consumed Sept. 30 to Dec. 31	Tons of 2,000 pounds: On hand Dec. 31
Cottonseed	2,851,523	1,291,919
Peanuts, hulled	3,689	432
Peanuts, in the hull	185	145
Copra	49,909	18,532
Coconuts and skins	1,294	380
Rapeseed	2	.....
Corn germs	53,533	295
Flaxseed	310,382	172,324
Castor beans	12,204	4,102
Mustard seed	334	672
Soya-beans	2,566	1,553
Olives	1,377	34
Other kinds	178	200

IMPORTS OF FOREIGN FATS AND OILS, QUARTER ENDED DEC. 31, 1926

Kind	Pounds	Kind	Pounds
Whale oil	4,901,468	Palm oil	28,536,150
Cod and cod-liver	12,765,008	Palm-kernel oil	384,139
Other fish oils	5,666,430	Peanut oil	676,591
Beef and hog fats	474,084	Rape oil	5,888,408
Wool grease	3,773,056	Linseed oil	255,279
Grease and oils, n. e. s. (value)	$58,702	Sesame oil	2,497,669
Chinese wood oil or nut oil	22,937,365	Soya-bean oil	5,026,217
Coconut oil	80,331,476	Vegetable tallow	511,000
Olive oil, edible	15,278,197	Vegetable wax	2,177,321
Sulphur oil, or olive foots	4,642,048	Other vegetable oils	317,781
Olive oil, denatured	1,266,991	Glycerin, crude	4,939,829
		Glycerin, refined	3,887,433

EXPORTS OF FOREIGN FATS AND OILS, QUARTER ENDED DEC. 31, 1926

Kind	Pounds	Kind	Pounds
Beef and hog fats	427,822	Olive oil, edible	128,943
Fish oils	1,164,535	Palm and palm-kernel oil	276,420
Other animal oils, fats and greases	118,254	Peanut oil	279,132
Chinese wood oil or nut oil	1,416,333	Soya-bean oil	346,898
Coconut oil	1,604,603	Other vegetable oils	711,209
		Vegetable wax	129,174

EXPORTS OF DOMESTIC FATS AND OILS, QUARTER ENDED DEC. 31, 1926

Kind	Pounds	Kind	Pounds
Oleo oil	22,821,935	Other animal greases, oils and fats	23,817,072
Neat's-foot oil	303,893	Coconut oil	4,794,672
Other animal oils	196,787	Cottonseed oil, crude	7,858,186
Fish oils	318,928	Cottonseed oil, refined	6,616,688
Oleo stock	1,838,203	Linseed oil	369,273
Tallow	2,945,829	Soya-bean oil	814,342
Lard	153,166,169	Corn oil	41,764
Lard, neutral	4,680,613	Vegetable oil lard compound	2,397,065
Lard compound, containing animal fats	3,566,240	Vegetable soap stock	1,570,334
Oleo and lard stearin	1,575,450	Other vegetable oils and fats	2,977,403
Grease stearin	518,843	Glycerin	172,494
Oleic acid, or red oil	72,329		
Stearic acid	351,658		

Dr. Clark to Conduct Basic Chemical Research Into Cottonseed Products

DR. E. P. Clark has been selected by the Interstate Cottonseed Crushers Association to get underway the program of basic research that has been under consideration for the past five or six years. Dr. Clark will conduct his investigations in the laboratories of the Bureau of Chemistry, and will have the cooperation of the entire staff of Government investigators.

The fact that this step has been undertaken is one that should be of particular gratification to the American Oil Chemists' Society. It was the Society which first proposed the step. It has been Society Chemists who have been behind the movement ever since. And in the personnel of this year's committee one finds leaders in the Society's activities. The committee for 1927 is composed of E. R. Barrow, chairman; W. H. Irwin, H. J. Morrison, Felix Paquin and David Wesson. Louis N. Geldert is secretary.

Dr. Clark will first take up the study of cottonseed meal. He already has begun a study of gossypol, and will endeavor to learn enough of its character and behavior to render it non-poisonous in feeding.

Dr. Clark is a graduate of Washington State College, Pullman, Washington. He received M.S. and Ph. D. Degrees at the University of Iowa, where in his postgraduate work he specialized in organic chemistry and bacteriology. Since that time, he has been engaged in organic chemical research.

E. P. Clark

The inauguration of this program of basic research marks a step of the greatest importance to the cotton oil industry.

REFINERY FOR SHERMAN, TEXAS PLANNED

The cotton oil refining plant of the old Mutual Refining Company at Sherman, Tex., has been purchased by the Munger Oil & Cotton Company, of Mexia, and is being renovated for early operation. The Munger Company has crude oil mills at Mexia and Teague.

The Chemical Composition of Tunisian Olive Oil

By GEORGE S. JAMIESON, RAYMOND M. HANN and WALTER F. BAUGHMAN

Oil, Fat and Wax Laboratory, U. S. Department of Agriculture.

THE composition of California and Italian oils has been determined previously in this laboratory and reported in this journal (2, 40 and 110, 1925). Recently oil expressed from olives grown in the Sousse district of Tunis* has been examined so that a comparison can be made of the composition of oils obtained from olives grown in different parts of the world.

Chemical and Physical Characteristics: The more important chemical and physical characteristics are recorded in Table I and for comparison the characteristics of the other two oils also are given. The methods used were the same as those used for the other two oils.

Unsaturated Acids: The iodine number of the unsaturated acids (103.6) indicates that this fraction of the fatty acids consists of oleic acid (iodine number 90.1) and linolic acid (iodine number 181.4). The following percentages were calculated using these iodine numbers.

	Percentage composition of unsaturated acid fraction %	In original oil %	Glycerides in original oil %
Oleic acid..	85.21	66.12	69.1
Linolic acid	14.79	11.48	12.0
	100.00	77.60	81.1

Saturated Acids: The saturated acids were separated from a portion of the oil and were esterified with methyl alcohol. This mixture of methyl esters (140 g.) was fractionally distilled under diminished

* (The oil was kindly furnished by Mr. Nathan Musher).

TABLE I. Physical and Chemical Characteristics of Olive Oil

	Tunisian oil	Italian oil bitonto type	California oil
Specific gravity, 25°/25°	0.9131	0.9120	0.9119
Refractive index, 20° C.	1.4700	1.4690	1.4690
Acid value	1.9	1.8	1.5
Iodine number (Hanus)	86.0	84.4	85.1
Saponification value	193.6	190.8	190.6
Unsaponifiable matter (%)	0.8*	1.1	1.0
Acetyl value	8.3	7.0	11.2
Saturated acids (determined) (%)	17.5†	....	....
Unsaturated acids plus unsaponifiable matter (determined) (%)	77.6	....	....
Iodine number of unsaturated acids plus unsaponifiable matter	103.8	....	....
Iodine number of unsaturated acids	103.6	94.2	94.8
Saturated acids (corrected) (%)	16.5	10.9	8.9
Unsaturated acids (corrected) (%)	77.6	83.3	85.2

*Iodine number 117.0.
†Iodine number 6.1.

TABLE II. Tunisian Olive Oil, Saturated Acids

	Percentage composition	Acids in original oil	Glycerides in original oil
	%	%	%
Myristic acid	0.82	0.13	0.1
Palmitic acid	83.44	13.77	14.4
Stearic acid	14.19	2.34	2.4
Arachidic acid	1.55	0.26	0.3
	100.00	16.50	17.2

pressure. The fractions were analyzed and their compositions were calculated in the same manner as described in the article on the California oil.

The results given in Table II were calculated from the analytical data obtained. The percentage composition of the saturated acid fraction is given in Column 1. These results are reduced to the basis of the original oil in Column 2 and the equivalent percentages of glycerides are given in Column 3.

The acids were recovered from some of these methyl ester fractions by saponifying with alcoholic potash and decomposing the resulting soap with hydrochloric acid. Palmitic, stearic and arachidic acids were isolated by fractional crystallization from alcohol the fatty acids obtained from various fractions. Their identity was established by their melting points and by observing whether or not these melting points were lowered when the substances were mixed with equal amounts of the respective acids which they were suspected of being and the purity of which had been established previously by elementary analyses. No acid with a molecular weight higher than that of arachidic acid could be detected. It was not possible to isolate pure myristic acid but after obtaining several crops of palmitic acid crystals from the lowest boiling fraction and reducing the volume of the mother liquor a small crop of crystals melting at 55°-56° C. was obtained. It is believed that it consisted of a mixture of myristic acid (m.p. 54° C.) and palmitic acid (m.p. 63° C.).

Discussion of the Results: The chemical compositions of the three oils are given in Table III.

An inspection of Table I will show that the specific gravities, refractive indices and saponification

TABLE III. Composition of Olive Oil

Glycerides of	Tunisian olive oil	Italian olive oil, Bitonto type	California olive oil
	%	%	%
Oleic acid	69.1	83.1	84.4
Linolic acid	12.0	3.9	4.6
Myristic acid	0.1	trace	trace
Palmitic acid	14.4	9.2	6.9
Stearic acid	2.4	2.0	2.3
Arachidic acid	0.3	0.2	0.1
Unsaponifiable matter	0.8	1.1	1.0
	99.1	99.5	99.3

values of the three oils lie close together. Also there is very little difference in the iodine numbers of the oils and the iodine numbers of the unsaturated acids fractions of the California and Italian oils are practically the same but the iodine number of the Tunisian oil unsaturated acids is higher. The Tunisian oil contains a considerably higher percentage of saturated acids and a lower percentage of unsaturated acids than the other two oils.

Lewkowitsch[1] states that the solid acids consist of palmitic acid and a minute proportion of arachidic acid but that Hehner and Mitchell did not detect stearic acid and therefore the absence of stearin must be taken as proven. Myddleton and Barry[2] give the composition of the acids in olive oil as palmitic 14.6 per cent; oleic 75.4 per cent, and linolic 10.0 per cent. Lapworth and Mottram[3] give oleic acid 72 per cent; linolic 12-13 per cent; higher saturated acids 14-15 per cent, and unsaponifiable matter 1.4 per cent. Eibner and Rasquin[4] report the composition of the oil as oleic acid 79.7 per cent; linolic acid 6.7 per cent; palmitic acid 5.5 per cent; stearic acid 3.4 per cent; and glycerol 4.2 per cent, while Taüfel and Saria[5] report the composition of Spanish oil as oleic acid 83.9 per cent, linolic 0.5 per cent, palmitic 7.5 per cent, stearic 2.3 per cent, glycerol 4.4 per cent and unsaponifiable 0.8 per cent.

Looking at Table III, the reader will observe that the composition of California and Italian oils is quite similar, the greatest difference being 2.3 per cent in the amounts of palmitic acid glyceride present. But the Tunisian oil composition is much different. It contains 14-15 per cent less of oleic acid glyceride than the other two and about three times as much linolic glyceride. It has twice as much palmitic glyceride as the California oil. The content of stearic acid and arachidic acid glycerides is about the same in all three samples.

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[1] (Chemical Technology and Analysis of Oils, Fats and Waxes, Ed. 6, *1*, p. 362).
[2] Fats; Natural and Synthetic, page 107.
[3] J. Chem. Soc., 127, 1628 (1925).
[4] Chem. Umschau, *33*, 29-38 (1926).
[5] Anales soc. espan. fis quim., *24*, 25-40 (1926).

WESSON OIL BAROMETER INDICATES FAIR WEATHER

Definite proof that the cotton oil industry is on a sound basis and that the outlook is favorable for some time to come was furnished by the announcement late in January that Wesson Oil & Snowdrift Company had placed its common stock on a regular dividend basis. Holders of Wesson Oil Common will receive their first dividend on April 1st.

This action can be noted with considerable interest by the trade. In the short period of its history, Wesson Oil & Snowdrift has established a record for conservative management. Since its organization nearly two years ago, the company has consistently followed a policy of plowing back its earnings into the business, and its profits have not been dissipated by large disbursements to stockholders. On the other hand, a large block of preferred stock was acquired on the open market by advantageous purchases, and this stock has been cancelled.

In addition to placing the common stock on a regular dividend

(*Continued on page* 78)

Determination of Detergency of Soap Products

The Report Published in January Oil & Fat Industries Is Supplemented by the Comments of Collaborators

In the January number of Oil & Fat Industries, L. F. Hoyt, Chairman of the American Oil Chemists Society Sub-Committee on Determination of Detergency, published a paper which might be designated as a progress report. Equally of interest are the comments of collaborators in the work, which are given below.

THERE was difficulty in soiling the cotton sheeting uniformly and to the proper shade. The removal of sizing by boiling with acid as advised, rather than by washing with hot soap solution is of questionable advantage. Filtration of the soiling mixture through sheeting from which the sizing had been removed was found to be unsatisfactory, since the pores soon became clogged with lampblack and after the first few minutes only a clear filterate came through. The use of a double thickness of cheesecloth seemed to take out any clots and to avoid the above difficulty, and hence cheesecloth was adopted in place of the cotton. During the actual soiling process, evaporation of the CCl_4 was very rapid, resulting in such progressive concentration of the solution as to make a uniform, equal soiling difficult in two successive attempts.

"Attempts on a second day to match the strips soiled the day before rarely resulted in getting the same shade, although the same formula of soiling mixture and as nearly as possible the same technique were used, and even though the numbers recorded by comparison with the standard paper or paste scales might be the same. The steps between successive paper or paste standards were greater than gradations in cloth quite noticeable to the eye. The India Ink Cloth Scale was found to be unsatisfactory, due both to the magnitude of the gradations, and to the difference in chroma between the India Ink soiling and that with the lampblack mixture. The difference in chroma was found to be less between the soiled cotton strips, on the one hand, and the paper or paste scales on the other; however, the difference in texture, in surface smoothness and reflection of light militated against the last two scales, and necessitated holding the objects to be compared at a distance of fifteen or twenty feet from the eye. When viewed at close range the cotton cloth seemed to match a much lighter paper or paste standard than when viewed at a distance.

"Since soiling on two successive days did not produce towels that were alike, even though checking the same scale numbers, the A.O.C.S. recommendations were deviated from, in that the pieces of cloth for the complete series of washes were taken from a single strip of cotton, soiled at one time; the pieces were therefore soiled exactly alike, but varied in age from 1 hour to 32 hours before washing.

Also when ironing 'with a warm iron,' the warmth of the iron is a variable factor. We experienced occasional spotting of the cloth when ironed, and in place of ironing we therefore spread the cloths flat in an oven at 130°C., and dried to a smooth condition.

"In all washes, distilled water was used both for the soap solution and for the rinse. Washing experiments in this laboratory for a number of years have clearly shown that the use of rinse water containing hardness would give a darker cloth after washing than when distilled water was used."

* * *

"The results with these few tests we consider decidedly tentative and not in any way final. We are unable to draw any conclusions from our results thus far. More work is required.

Soil

The A. O. C. S. materials were employed. The soil was made up:

2 g. Lampblack
3 g. Tallow
5 g. Mineral Oil
2000 cc. CC1.

Method of Soiling

"Strips of sheeting about 15 ft. long were run through the solution and then between the rollers of an ordinary clothes wringer. We found that the tension on the rollers made a difference in the color of the soiled cloth and that if the rollers were screwed down tightly and the cloth run through the solution and the rollers a second time, the soil was deposited more evenly on the cloth than if the strips were run through the rollers loosely adjusted only once. Our cloth was all soiled by putting through the rollers twice.

"We seem able to get the soiled cloths more closely uniform in respect to depth of color using the Ives Tint Photometer than when we depend entirely upon the Munsell Paper Scale; that is, we appear to be able to detect smaller differences in the color with the Photometer.

"From the little work we have done it seems that we get a more uniform soil of the cloth if we mix up the soil and allow it to stand for a day or two before soiling the cloth.

"In making further detergent tests our experience indicates that time would be saved and equally reliable results obtained if one 15-minute washing were made rather than three 5-minute washings."

* * *

"On making the color readings of the cloth, we find that the color varies at different sections and it is hard to pick out the spot on the cloth that is of the average color to compare with the scale. We find that the strips of cloth wash whiter nearer the ends. We believe for this reason that it would be better to take photometer readings on each quarter of the cloth, folded as directed to form a piece 3" x 4½" and take the average of these readings. We found 8 per cent difference in these readings on the same piece of cloth."

* * *

"We found that sizing is not removed from the cloth upon boiling for 5 minutes in dilute hydrochloric acid. We found it necessary to boil with acid and then alkali and then to wash with soap.

"We found that 4 grams of lampblack were required in your formula using x grams in 2 liters of carbon tetrachloride in order to give soiled cloth which matched your sample (i.e. S 48). Samples were soiled in this solution and

withdrawn from the soiling bath between 2 glass rods held together at one end by a rubber band and by hand at the other end. The solvent was evaporated by holding the cloth before an electric fan. This soiled cloth was pressed at once with a hot flat iron and the washings begun within an hour."

* * *

"After some considerable work for the purpose of developing the proper technique it was found possible to duplicate the standard soil (S 48) very closely. The matching of color with the various scales, however, involves considerable personal element. We believe that an effort should be made to lessen this variable by a closer approach in the standards to the bluish grey of the soiled cloths."

* * *

"Have carried this work a little further than was originally outlined; for example, have done the work with both distilled water and tap water rinse, also have read our washings on all three scales submitted.

"If some of the other committee members have used the tap water rinse, it would be interesting to note just what effect the total hardness of the rinse water, which varies in different cities, has to do with the resultant color of the cloth. Chicago tap water runs about 9.0 grains total hardness.

"In regard to color standards: We found that the pastes were the most satisfactory. Considerable complaint has been presented against these pastes due probably to the sheen and glossiness of the glass containing the paste but we found this of no objection whatsoever.

"In many cases there were cloths, when completely washed, that would show a difference in color to the eye, yet the reading on the scales would be the same, on account of lack of intermediate standards.

"This work has been very interesting and as it develops I feel that some valuable information and data will be compiled."

* * *

"The samples of cloth colored by India ink were not as satisfactory as the colored papers, for the reason that the differences between each were too great to permit close evaluation. It seemed rather unfortunate that the paper standards had a bluish tint which made it necessary to match by intensity, rather than by exact shade of color.

The Soiling Solution: "We met with the difficulty that in following the method as given, the lampblack was retained on the filter cloths to a variable extent, and that which did not pass through was not well suspended. By using Dr. Walker's method of grinding the lampblack with the mineral oil before adding any CCl_4, a satisfactory suspension was obtained.

"We wish to comment on the soiling solution from the point of view of its analogy to dirt actually encountered in practice. Carbon is certainly a considerable factor in the dirt which has to be removed in the vicinity of industrial centers, but there are a great many localities where this kind of dirt is negligible and detergents are called upon to deal with silicious materials almost exclusively. Lampblack is convenient on account of its color, but it is not typical of silicious soil which may be deflocculated by detergents in a very different way. There are some colored materials which behave more nearly like silicious dirt than lampblack. Some work has

recently been done under Bancroft, using manganese dioxide. Bone black is another possibility, but perhaps the most nearly typical material that could be worked out on a color scale might be a raw umber.

"This study will ultimately be extended to detergents other than pure soap which, in our opinion, makes it desirable to select a soiling mixture as nearly typical as possible, rather than one which works well with soap but may give misleading results with other useful washing materials.

"It is known that detergency cannot be rightly appraised by chemical analysis or yet by measurements of surface tension, and until it is possible to measure and evaluate the various factors which contribute to detergency, we believe that the test should be made to simulate as closely as practicable the conditions of actual washing. Perhaps, this could best be done by standardizing a mixture of lampblack with some other highly colored substance which reacts more nearly like silicious dirt."

* * *

"Soil Solution": After being advised that the original soil should be 25 per cent brightness (S 48 of the Munsell Scale) it was found practicable to make up the soil solution according to the directions given excepting that the solution could not be filtered through several thicknesses of washed sheeting. It was filtered through a No. 100 sieve.

"Soiling": The strips of sheeting, from which the sizing was removed, were immersed in the soil solution, allowed to dry by suspending in the air and finally placing in a drying chamber for a few minutes. No wringer or iron were used.

"Washing": The observation that soiled cloths several days old do not wash out as white as freshly soiled cloths, was confirmed. A difference seemed apparent between cloths soiled one day and washed the next, and cloths which were soiled and washed the same day.

"The speed of the washing machine was maintained at 250 r.p.m. —25 r.p.m. Temperatures were held to within 1° or 2° of those specified. Distilled water was used exclusively. After the first, third and fifth washes, four rinses were used. After thesecond and fourth wash only three rinses were used. The cloth was removed from the machine and allowed to dry partially by suspending in the air and then placed in the drying chamber for 10 or 15 minutes."

Discussion of Results

The incomplete and variable reports obtained from this year's work scarcely warrant drawing definite conclusions, although in the case of Tallow Soap the *average* results after the fifth washings indicate a definite improvement of detergency with increase in temperature, while with Olive Castile Soap the average results indicate very little change of detergent value with increase in the temperature of the washing test.

The results of this year's work, while admittedly incomplete and tentative, indicate that with the present form of detergency test (1) the *same* investigator finds very little difference between the soaps tested and (2) different investigators report quite variable results for the same soap.

It should be emphasized that although identical sets of materials and washing machines were used

by the various members of the committee, the technique of the involved and lengthy processes of soiling, repeated washings and rinsings and particularly the matching of color of the soiled and washed cloths unavoidably involves the personal equation to such an extent that it is not surprising that results reported by different investigators are not uniform.

Replies from a questionnaire addressed to members of the committee resulted in a practically unanimous choice (1) of the Munsell Paper Scale as against a standard scale of cloths soiled with India ink and (2) approval of 12 steps as in the present Munsell Scale as being a satisfactory number. Replies from some of the members who had opportunity to use sets of Dr. Walker's gray pastes showed a difference of opinion, about equally divided, as to whether these pastes were preferable to the Munsell Scale or not. It would seem advisable for members who have used the gray pastes to pass them on to other members of the committee for trial and comment.

The fact that the use of hard water for rinsing in washing tests would result in darker cloths than when distilled water is used, was confirmed by several other members of the committee. Hence, it is clear that to secure at all comparable results between collaborators, the use of distilled water in washing and rinsing should be adhered to unless it can be shown that the hardness of a particular water supply is such that no difference results when it is used in place of distilled water.

The cotton sheeting supplied by the chairman for this year's program unfortunately contained considerable starchy filler which was troublesome to remove before soiling as commented upon by some of the members of the committee. In future detergency work a fabric free from filler should be used to avoid difficulties of this character.

Judging by the comments of collaborators, the following factors may have influenced differences in results reported by investigators:

1. Difficulty in thoroughly removing starchy filler in sheeting supplied.

2. Variations in procedure of soiling, found necessary by collaborators to attain a soiled cloth of the prescribed shade.

3. Difference in chroma between the soiled fabric and the standard Munsell papers, coupled with the probability that various observers may not have the same degree of eye sensitivity in matching the shades of gray involved.

4. Possible effect of such factors as temperature of drying and ironing the soiled and washed cloths, and method of making up the soap solutions.

The chairman feels, and believes that other members of the committee likewise feel, that the work on determination of detergency should be continued. A start has been made but much intensive work remains to be done before it can be definitely concluded whether or not the type of detergency test on which we are working can be so perfected that in the hands of various investigators it will consistently differentiate the detergent value of soaps of widely different composition and properties.

The chairman wishes to express his sincere appreciation of the large amount of time and effort devoted to the work on detergency by the members of this year's committee and their assistants.

Refining Test Methods Are Revised

By C. B. CLUFF

Chairman, Refining Test Committee

The following revised method for refining tests has been approved by the Refining Committee of the American Oil Chemists Society.

Rule 264: Crude Cottonseed Oil Chemists Reports

(See Rule 272 for Method of Analysis)

Determination of Color and Excess Loss. Refining tests for settlements, shall be subject to the following provisions:—

(a) At least three refinings shall always be made, using different strengths or amounts of sodium hydroxide, endeavoring to obtain a prime color with loss not over 9 per cent; the maximum amount permitted in rule 272 must be used on at least one of these refinings when the F.F.A. of the oil do not exceed 3 per cent, and on at least two of the refinings when the F.F.A. exceed 3 per cent. If a prime color with loss not over 9 per cent is not obtained, proceed as follows:

Color	Loss	Procedure
Prime or better	Over 9%	See paragraph (b)
Darker than Prime	9% or less	See paragraph (c)
Darker than Prime	Over 9%	See paragraph (d)

(b) If a prime color is obtained with loss over 9 per cent, additional refinings with less sodium hydroxide must be tried to obtain a prime color with the lowest possible loss.

(c) If the color is darker than prime, with loss under 9 per cent, additional sodium hydroxide over the normal maximum of rule No. 272 may be used, and if this gives a prime color with loss not over 9 per cent, this result is to be reported, but otherwise the results obtained with the normal maximum lye of rule No. 272 shall govern.

(d) If a prime color cannot be obtained without exceeding 9 per cent loss even as provided in paragraph (c) of this section, or if the color is darker than prime with loss over 9 per cent when using the maximum sodium hydroxide of rule No. 272, then of two or more tests showing varying results in color, that test which produces the best color must be reported, unless another of the tests produces an oil which is darker in color reading than this lighter oil by not more than 10 per cent, with a reduction in loss greater than the numerical difference in color reading; in which case the latter result is the one to be reported.

Illustration:

1—loss 12% Color, Red 10

2—loss 10.8% Color, Red 11

REPORT

(e) Chemists' reports for use in settlements must show the following data:

Free fatty acids, to tenths of one per cent.

Color of refined oil, in terms of 35 yellow and necesary red to produce best match.

Flavor of refined oil.

Amount and strength of lye used in refining.

Refining loss, to tenths of one per cent.

Rule 272: Crude Oils

(See Rule 264 for reporting refining tests for settlement purposes)

Section 1. *Mixing Sample*: Shake thoroughly with the can in

an inverted position, before removing any of the oil for analysis. If oil is cold, it must be warmed to 70°F, before attempting to mix.

Section 2. *Moisture or Volatile Matter*: Place in a tared metal or porcelain dish 10 grams of the well mixed sample, heat gently over a direct flame with a rotating or rocking motion, until oil barely smokes. Cool and report loss in weight as Moisture. Reserve for Meal Determination.

Section 3. *Meal or Impurities:* Wash the residue from the moisture determination into a beaker with kerosene and warm to dissolve the Oil content. Filter the resulting mixture on a tared Gooch crucible and wash the residue with petrolic ether until free from Oil. Dry to constant weight, divide by 0.8 and report as per cent Meal or Impurities.

Section 4. *Free Fatty Acids:* Weight 7.05 grams of the well mixed crude oil into a four-ounce bottle or 250 cc. flask. Add 50 cc. of freshly neutralized, denatured alcohol, or freshly neutralized saturated salt solution, and about 2 cc. of 1 per cent phenophthalien solution or alkali blue indicator. Titrate with 0.25 N NaOH solution, until upon the addition of one drop and violent shaking of the mixture a permanent change in color is produced. Report as per cent free fatty acids, oleic, the number of cubic centimeters of 0.25 N NaOH used in the titration.

Section 5. *Refining Crude Cottonseed Oil:*

(A) *Apparatus:*

Scales, 1000 grams capacity, sensitive to ½ gram. Weights, 500 grams to ½ gram.

Refining cups. Seamless or enameled iron cups, 4 to 4½ inches in diameter and 4 to 4½ inches deep, with a total capacity of about 900 cc.

Refining apparatus, a mechanical stirrer having T-shaped paddles with flat (not twisted) blades 1 inch wide and 3½ inches over all, set at right angles to the shaft of the paddle. Each paddle must be driven by a gear, or with other positive device, which will give the required speed without slipping even under maximum load. (Note: It is recommended that after September 1, 1928 only gear drives be permitted.) Speed of paddles in the cold water bath must be 250 ± 10 R.P.M. and the speed of paddles in the hot water bath must be 70 ± 5 R.P.M. The motor and driving belt or chain must be of sufficient capacity to drive all the paddles simultaneously at the specified speeds under full load.

Two water baths with thermometers, suitably arranged to hold cups while stirring; one bath to be maintained at 18° to 22°C, using ice to cool it to this temperature, if necessary, and the other maintained at 63° to 67°C. Level of water in the baths must be as high as the level of oil and lye in the cups, and the water must be continuously agitated to mantain uniform temperatures.

(B) *Sodium Hydroxide Solutions:*

These solutions must be of accurately known sodium hydroxide content, free from carbonate and other impurities and must be prepared in the following manner:

A super-saturated solution is first prepared by adding to each kilogram of pure, dry solid sodium hydroxide broken up into small pieces; ¾ of a kilogram of distilled water. Heat on the steam bath with occasional stirring, for at least three hours. Then allow

to settle and cool for 24 to 48 hours, keeping the vessel covered, to exclude air as far as possible. During the cooling a portion of the sodium hydroxide which had dissolved in the hot solution will crystallize out, and under these conditions the solution will then contain no measureable amount of carbonate. If such crystals do not separate out, the solution was not super-saturated.

Decant the solution from the residue, and if not perfectly clear filter through filter paper or asbestos. Dilute to the various concentrations required with distilled water which has been previously boiled and cooled. The final strength of the diluted solutions must be adjusted by actual titration, and not be specific gravity tests. The important point is to know the exact content of sodium hydroxide rather than the exact specific gravity or Beaume. Solutions of only the following strengths shall be used and they must be within the limits shown.

SODIUM HYDROXIDE TABLE

Nominal Degrees Beaume at 15° C.	Actual NaOH Content	Allowable Variations	
		Minimum	Maximum
10	6.57%	6.44%	6.70%
12	8.00	7.84	8.16
14	9.50	9.31	9.69
16	11.06	10.84	11.28
18	12.68	12.43	12.93
20	14.36	14.07	14.65
22	16.09	15.77	16.41
24	17.87	17.51	18.23
26	19.70	19.31	20.09
28	21.58	21.15	22.01
30	23.50	23.03	23.97

(C) *Choice of Lye.*

The maximum amount of sodium hydroxide allowable for refining shall be calculated from the following formulae:

For hydraulic or hot pressed oils:

$$\frac{\text{F.F.A.}}{5.2} \quad .54 = \text{Maximum NaOH}$$

For expeller or cold pressed oils:

$$\frac{\text{F.F.A.}}{4.365} + .77 = \text{Maximum NaOH}$$

The strengths of lye (expressed in Beaume degrees) to be used for refining oils of various F.F.A., shall be as follows:

Per Cent F. A. A.	Hydraulic Oil	Expeller Oil
1.5% or less	10° and 14° Beaumé	12° and 18° Beaumé
1.6-3.0	12° and 16°	16° and 20°
3.1-4.0	14° and 18°	16° and 20°
4.1-5.0	16° and 20°	16° and 20°
5.1-7.5	18° and 22°	20° and 26°
7.6-10.0	20° and 24°	20° and 26°
10.1-15.0	20° and 26°	20° and 30°
Over 15.0	22° and 28°	20° and 30°

Note: Lyes of intermediate strength between the two required by the above table may also be used, but results from same are only to be used when better than can be obtained with either of the strengths specified in the table.

The table on the page following shows the maximum percentage of each strength of lye allowable.

(D) *Refining Process:*

Place 500 grams of the thoroughly mixed sample of crude oil in a tared refining cup. Adjust the temperature of the oil and of the water bath to 18-22°C. Agitator must run at the rate of 250 R.P.M. plus or minus 10. Add the proper amount of NaOH solution to the oil, as quickly as possible, with the agitator running, and stir exactly 10 minutes (30 minutes to 60 minutes for expeller or cold pressed oil) from the time the lye is added. Then immediately transfer to the 65°C hot water bath, and stir at 70 = 5 R.P.M. for eight minutes. Temperature of oil must then be 55 to 60°C, adjusting the temperature of the water bath, if necessary, within the limits specified, to obtain this final oil temperature. Stop agitator and allow to settle in the water bath at 65°C for one hour. Cool by setting in the cold bath 30 minutes and allow to remain at normal room tempera-

	For Hydraulic or Hot Pressed Oils — Per Cent Lye of Varying Beaumé at 15° C. Containing Maximum NaOH										For Expeller or Cold Pressed Oils — Per Cent Lye of Varying Beaumé at 15° C. Containing Maximum NaOH				
% FFA	Max. NaOH	12°	14°	16°	18°	20°	22°	24°	26°	28°	Max. NaOH	16°	20°	26°	30°
1.5	.83	...	8.7	...	...	...	...	...	...	...	1.11	...	...	...	...
2.0	.93	11.7	...	8.4	...	...	...	...	...	...	1.23	11.1	8.5	...	...
2.5	1.03	12.9	...	9.3	...	...	...	...	...	...	1.34	12.1	9.3	...	...
3.0	1.12	14.0	11.8	10.1	8.8	...	...	...	...	...	1.45	13.1	10.1	...	...
3.5	1.22	...	12.8	...	9.6	...	...	...	...	...	1.56	14.1	10.9	...	...
4.0	1.31	...	13.8	...	10.4	9.1	...	...	...	...	1.68	15.2	11.7	...	...
4.5	1.41	...	...	12.7	...	9.8	...	...	...	...	1.80	16.3	12.5	...	...
5.0	1.50	...	...	13.6	11.8	10.4	9.3	...	...	...	1.92	17.4	13.3	9.8	...
5.5	1.60	...	...	...	12.6	...	9.9	...	...	...	2.03	...	14.1	10.3	...
6.0	1.70	...	...	...	13.4	...	10.5	...	...	...	2.14	...	14.9	10.9	...
6.5	1.79	...	...	...	14.1	...	11.1	...	...	...	2.25	...	15.7	11.4	...
7.0	1.89	...	...	...	14.9	...	11.7	...	...	...	2.37	...	16.5	12.0	...
7.5	1.99	...	...	...	15.7	13.9	12.4	11.1	...	...	2.49	...	17.3	13.6	...
8.0	2.08	...	...	...	...	14.5	...	11.6	...	...	2.60	...	18.1	13.2	...
8.5	2.18	...	...	...	...	15.2	...	12.2	...	...	2.72	...	18.9	13.8	...
9.0	2.27	...	...	...	...	15.8	...	12.7	...	...	2.83	...	19.7	14.4	...
9.5	2.37	...	...	...	...	16.5	...	13.3	...	...	2.94	...	20.5	14.9	...
10.0	2.46	...	...	...	...	17.1	...	13.8	12.5	...	3.06	...	21.3	15.5	13.0
10.5	2.56	...	...	...	...	17.8	...	...	13.0	...	3.17	...	22.1	...	13.5
11.0	2.65	...	...	...	...	18.4	...	...	13.4	...	3.29	...	22.9	...	14.0
11.5	2.75	...	...	...	...	19.1	...	...	13.9	...	3.40	...	23.7	...	14.5
12.0	2.84	...	...	...	...	19.8	...	...	14.4	...	3.52	...	24.5	...	15.0
12.5	2.94	...	...	...	...	20.5	...	...	14.9	...	3.63	...	25.3	...	15.5
13.0	3.03	...	...	...	...	21.1	...	...	15.4	...	3.75	...	26.1	...	16.0
13.5	3.13	...	...	...	...	21.8	...	...	15.9	...	3.86	...	26.9	...	16.4
14.0	3.23	...	...	...	...	22.5	...	...	16.4	...	3.98	...	27.7	...	16.9
14.5	3.32	...	...	...	...	23.1	...	...	16.9	...	4.09	...	28.5	...	17.4
15.0	3.42	...	...	...	...	23.8	21.3	...	17.4	15.9	4.20	...	29.3	...	17.9
15.5	3.52	...	...	...	...	...	21.9	...	...	16.3	4.32	...	30.1	...	18.4
16.0	3.62	...	...	...	...	...	22.5	...	...	16.8	4.44	...	30.9	...	18.9
16.5	3.71	...	...	...	...	...	23.1	...	...	17.2	4.55	...	31.7	...	19.4
17.0	3.81	...	...	...	...	...	23.7	...	...	17.7	4.67	...	32.5	...	19.9
17.5	3.90	...	...	...	...	...	24.3	...	...	18.1	4.78	...	33.3	...	20.4
18.0	4.00	...	...	...	...	...	24.9	...	...	18.5	4.90	...	34.1	...	20.9
18.5	4.10	...	...	...	...	...	25.5	...	...	19.0	5.01	...	34.9	...	21.3
19.0	4.19	...	...	...	...	...	26.1	...	...	19.4	5.13	...	35.7	...	21.8
19.5	4.29	...	...	...	...	...	26.7	...	...	19.9	5.24	...	36.5	...	22.3
20.0	4.38	...	...	...	...	...	27.2	...	...	20.3	5.35	...	37.2	...	22.8

Part of table which could not be included above

F.F.A.	Max. NaOH	10°	Max. NaOH	12°	18°
1.5	.83	12.6	1.11	13.9	8.8

ture until the soap stock becomes hard and firm. Weigh the refining cup and contents, and deduct this weight from the total weight at beginning of test to obtain loss by evaporation. Decant the refined oil into a tared refining cup and drain the soap stock for 30 minutes. This oil is to be used for determination of grade. Weigh both oil and soap stock cups and contents. Melt the soap stock by setting it in water bath at 75° ± 2°C; without stirring, for 30 minutes; decant and weigh separately any additional oil thus recovered. Add this weight to the weight of refined oil first obtained, and subtract it from the soap stock weight. Repeat the remelting, if necessary, for periods of 30 minutes each until the recovered oil from the last remelting amounts to not over 2.5 grams.

Calculations: Determine refining loss by two methods of calculation, the results of which should check within one-quarter of one per cent.

Method No. 1: Weight of Crude Oil minus weight of Refined Oil gives refining loss.

Method No. 2: Weight of Soap Stock plus loss in evaporation, minus weight of NaOH solution used gives refining loss.

Lime Soaps in Olive Oil Foots

By M. F. LAURO

Bureau of Chemistry, New York Produce Exchange

SINCE Sulphur Oil or Olive Oil Foots is the residual oil in the pulp, from which it is extracted by carbon bisulphide after the commercial and edible oils are pressed out, it follows that no rigid specifications are drawn for this oil as in the case of other oils. Moisture, impurities insoluble in carbon bissulphide or ether, and soap color are the general determining values of its quality.

The matter of soap color has already been discussed in an article by Trevithick and Dickhart (JOURNAL OF OIL & FAT INDUSTRIES, April 1926), as also moisture and oil containing excessive stearine, by Trevithick and Lauro of this Bureau (Ibid, March, 1926).

Regarding impurities other than the usual dirt, fiber or foreign matter insoluble in carbon bisulphide or ether, we may consider the presence of metallic soaps, dyes or added coloring matter, ash and unsaponifiable in excess of normal, as matters worth looking into, in special cases.

Recently a few shipments of foots have presented instances rather puzzling at first to the merchant in that the usual chemical certificate of analysis revealed no sign of the presence of any abnormality in the quality of the foots. The test for impurities showed a content of insoluble in the hundreths of one per cent. And yet, upon further examination, there was found as much as 30 per cent of lime soaps in the oil. This is possible, because under the conditions of the solubility tests, lime soaps will escape detection, they being completely soluble in warm ether or carbon bisulphide. Upon standing in cold ether, the bulk of the soap will settle out of solution as a white amorphous powder, which again dissolves on warming. Cold carbon bisulphide, however, does not appear to throw down any of this soap.

The appearance of the foots was not unlike those from which the more liquid portions had been removed and which therefore contained excessive stearine, and analyzed with iodine values of 60 to 66 and titers of 35° to 39°C. The consistency is thick and jelly-like at a temperature 75° to 84° F. when the usual condition of olive oil foots at this temperature is practically liquid. This slime-like character of the foots gave cause for suspicion and led to its re-examination along lines not directly routine.

As to how the lime soaps came to be in the foots is problematical, since a chemist is without the necessary knowledge of its history. It may, however, have come through the use of lime in reducing the acidity of the last commercial oil pressed from the marc and thus found its way by extraction with carbon bisulphide into the foots. At times, pulp is allowed to ferment in cement-lined cisterns or wells for a time; or the foots are stored in such tanks. The high acid content reacting with the lime may dissolve and incorporate a por-

tion of it as metallic soap. It is not likely, however, that the large content of lime soap in the oils examined could come from this source.

The merchant would therefore do well to demand additional analysis to the customary "M. I. and Soap Color," when the appearance of the sample is such as to arouse suspicion. For whether the foots contain an excess of stearine and otherwise are normal; or whether they contain lime soaps, irrespective of the question of delivery being a proper one; or not; as normal olive oil foots, such shipments will no doubt meet with grave objections on the part of the textile soap maker. In the first case, he will find it difficult to saponify harder oil, since his equipment and process are elementary in nature. In the second case, the presence of the lime clots the soap in the making, preventing it from "closing" to a smooth finish.

Lime is objectionable in the waters used in the dyeing of silk goods, since the deposition of lime soap upon the cloth makes for unequal dyeing later. The finished goods will show a "patching" effect when held to the light. Lime previously contained in soap to be used in washing textiles is therefore distinctly undesired.

From the analytical standpoint, metallic soaps can be detected by ashing the sample and testing this for the presence of metal. The normal ash content of foots is around 0.15 per cent. It is very light and fluffy in appearance and reddish or rust-like in character, since the chief impurity in the ash is iron oxide. The amount of ash multiplied by ten would give a rough approximation of the metallic soap present, which may be obtained accurately in another way.

The foots may be boiled with hydrochloric acid to break up the lime soaps, and after washing to remove the mineral acid, may be titrated for total acidity. This would, therefore, include the acid on the original oil and that resulting from the soap by the hydrochloric acid treatment. The free fatty acid content is determined on a separte sample of the original foots and is subtracted from the above figure giving the percentage of acidity due to the metallic soap. The ash content added to this amount of fatty acid will give the quantity of metallic soap present (chiefly, lime soaps).

Or, as suggested by H. P. Trevithick, the moisture and impurities are subtracted from one-hundred per cent, thus giving the percentage of total oil present in the sample. The sum of free fatty acid and neutral oil taken from this figure gives the percentage of lime soap present by difference.

Analysis of two lots of oil containing lime soaps:

	M. F. Lauro	W. H. Dickhart
Moisture	5.00%	4.90%
Impurities	0.16%	0.16%
Soap Color.....	Prime Green (Good)	Prime Green (Poor)
Unsaponifiable Matter	2.20%	1.96%
Ash	3.21%	3.63%
Iodine No.....	86.9	85.2
Saponifiable No..	191.5	190.3
Free Fatty Acid.	52.00%	55.00%
Free Oil	8.00%	7.9 %
Metallic Soaps (by difference) Lime, Iron, etc.....	31.6 %	28.4 %

The iodine and saponification values are as above, when calculated to pure oil, and are free of soap, water and impurities; show-

(*Continued on page* 80)

Domestic Exports of Lard Compounds and Oleomargarine from the United States During November

Countries	Lard compounds containing animal fats		Oleomargarine of animal or vegetable fats		Vegetable oil lard and compounds	
	Pounds	Dollars	Pounds	Dollars	Pounds	Dollars
Belgium	2,160	536	.....	.....	.....	.....
France	.....	.....	.....	.....	10,378	2,200
Germany	.....	.....	.....	.....	48	11
Greece	19,151	2,298	.....	.....	36	8
Italy	.....	.....	.....	.....	13,018	1,730
Netherlands	.....	.....	125,058	13,938	.....	.....
Norway	298,756	37,403	.....	.....	5,500	600
United Kingdom	117,790	14,776	.....	.....	47,373	5,184
Canada	7,360	1,007	31,507	2,886	69,882	10,218
B. Honduras	21,828	2,640	50	12	412	56
Costa Rica	.....	.....	112	26	1,524	264
Guatemala	.....	.....	.....	.....	11,243	1,760
Honduras	900	127	.....	.....	4,796	807
Nicaragua	3,344	414	.....	.....	1,079	180
Panama	25,802	3,333	24,040	4,334	9,113	1,405
Salvador	932	164	.....	.....	100	19
Mexico	87,685	10,577	150	35	216,425	23,887
Newfoundland and Labrador	78,243	9,076	.....	.....	17,898	2,166
Bermuda	1,750	279	180	36	1,198	238
Jamaica	1,620	206	.....	.....	3,460	575
Trinidad and Tobago	3,100	491	.....	.....	2,250	473
Other B. W. Indies	23,194	2,592	10,455	2,035	29,303	3,589
Cuba	325,026	37,818	1,200	256	316,177	36,865
Dominican Rep.	.....	.....	180	33	360	78
D. W. Indies	14,075	2,058	142	29	790	80
F. W. Indies	750	105	.....	.....	.....	.....
Haitian Republic	22,725	3,456	13,000	2,411	800	144
Virgin Is. of U. S.	24,670	3,278	8,368	1,594	34,028	3,428
Bolivia	7,000	910	.....	.....	.....	.....
Chile	94,570	13,382	.....	.....	24,285	3,412
Colombia	.....	.....	.....	.....	990	183
Ecuador	8,755	1,532	.....	.....	65,424	9,829
Peru	.....	.....	.....	.....	194	37
Venezuela	4,070	610	.....	.....	1,608	346
B. India	.....	.....	.....	.....	10,000	1,300
B. Malaya	.....	.....	.....	.....	785	206
China	72	18	.....	.....	13,756	3,375
Hongkong	.....	.....	.....	.....	180	40
Japan, inc. Chosen	.....	.....	.....	.....	3,788	638
Philippine Is.	1,550	6,936	.....	.....	7,209	1,567
Syria	368	40	.....	.....	.....	.....
French Oceania	96	14	.....	.....	182	22
N. Zealand	.....	.....	.....	.....	2,500	350
B. W. Africa	4,240	710	.....	.....	.....	.....
Other F. Africa	100	21	.....	.....	.....	.....
Total	1,241,682	156,807	214,442	27,625	928,092	117,270

Shipments from the United States to Non-Contiguous Territories.

Non-contiguous territories	Lard compounds containing animal fats	
Alaska	11,720	2,531
Hawaii	88,457	16,083
Porto Rico	90,023	13,102

Domestic Exports of Oleo Oil, Tallow, Oleic Acid or Red Oil, and Other Animal Greases, Oils and Fats, N. E. S., from the United States, During November

Countries	Oleo oil Pounds	Tallow Pounds	Oleic acid or red oil Pounds	Other animal greases, oils and fats n. e. s. Pounds
Belgium	146,667	59,008	.....	1,226,956
Denmark and Faroe Is.	309,206	.....	.....	.....
Finland	15,405	.....	.....	.....
France	.....	.....	.....	37,664
Germany	1,327,143	32,520	.....	52,277
Gibraltar	.....	365	.....	.....
Greece	500,323	.....	.....	.....
Italy	94,060	.....	.....	94,035
Latvia	.....	77,251	.....	50,968
Netherlands	2,050,848	172,626	.....	3,391,402
Norway	368,091	3,800	.....	62,150
Sweden	66,424	.....	.....	2,020
Switzerland	80,869	.....	.....	.....
United Kingdom	2,028,765	.....	.....	216,828
Canada	14,600	176,964	5,712	1,362,194
Costa Rica	.....	.....	1,599	20,800
Guatemala	.....	22,420	.....	4,000
Honduras	.....	136,259	.....	59,111
Nicaragua	.....	8,000	.....	32,000
Salvador	.....	.....	.....	16,400
Mexico	11,242	137,157	4,087	161,067
Newfoundland and Labrador	236,900	1,195	.....	.....
Bermuda	.....	.....	.....	267
Trinidad and Tobago	.....	624	.....	.....
Cuba	159,390	45,234	.....	774,486
Dominican Republic	.....	194,450	2,034	45,939
Haitian Republic	.....	1,400	.....	.....
Colombia	479	94,339	3,119	24,300
D. Guiana	.....	10,238	.....	.....
Peru	5,056	376	.....	.....
Japan inc. Chosen	13,455	17,411	.....	.....
Philippine Is	.....	4,366	.....	.....
Syria	57,338	.....	.....	.....
Australia	1,860	.....	.....	.....
F. Oceania	.....	.....	.....	300
B. S. Africa	.....	.....	.....	170
Egypt	9,441	.....	.....	.....
Quantity	7,497,600	1,196,003	16,551	7,635,334
Total Value	840,172	102,315	1,874	718,857

Wesson Oil Barometer

(*Continued from page* 65)

basis, Wesson Oil has placed on the market all of its treasury stock, both preferred and common, the proceeds of which will be utilized in expanding its manufacturing facilities. This indicates that in the judgment of the directors of the company the outlook for the cotton oil business appears undisturbed and that conditions at the present time warrant those engaged in this business proceeding aggressively and with confidence in laying out their plans for the future.

Imports of Olives, Coconut Meat and Coconut Oil, Into the United States During December

Countries	Olives in brine		Coconut meat dessicated, shredded, cut or similarly prepared	
	Gallons	Dollars	Pounds	Dollars
France	23	31	.....	.....
Greece	7,326	4,894	.....	.....
Italy	19,079	6,765	.....	.....
Portugal	9,996	11,028	.....	.....
Spain	230,124	180,254	.....	.....
Canada	2	6	.....	.....
Panama	.....	.....	.....	.....
Jamaica	.....	.....	.....	.....
Dominican Rep.	.....	.....	.....	.....
Br. Malaya	.....	.....	.....	.....
Br. India	.....	.....	.....	.....
China	48	32	.....	.....
Hongkong	172	114	65,040	4,770
Palestine	369	165	.....	.....
Philippine Islands	.....	.....	2,290,888	207,528
Syria	967	538	.....	.....
Br. Oceania	.....	.....	.....	.....
Fr. Oceania	.....	.....	.....	.....
Ceylon	.....	.....	2,372,820	217,303
Total	268,106	203,827	4,728,748	429,601

	Copra		Coconut oil	
	Pounds	Dollars	Pounds	Dollars
France	.....	.....	.....	.....
Greece	.....	.....	.....	.....
Italy	.....	.....	.....	.....
Portugal	.....	.....	.....	.....
Spain	.....	.....	.....	.....
Canada	17,483	844	.....	.....
Panama	2,900	147	.....	.....
Jamaica	6,148	255	.....	.....
Dominican Rep.	.....	.....	100	21
Br. Malaya	2,251,715	108,433	.....	.....
Br. India	.....	.....	44,682	4,585
China	.....	.....	.....	.....
Hongkong	.....	.....	.....	.....
Palestine	.....	.....	.....	.....
Philippine Islands	32,997,489	1,560,307	25,399,715	2,063,500
Syria	.....	.....	.....	.....
Br. Oceania	962,892	46,070	.....	.....
Fr. Oceania	3,792,843	186,396	.....	.....
Ceylon	.....	.....	.....	.....
Total	40,031,470	1,902,452	25,444,497	2,068,106

Imports of Peanuts, Peanut Oil, and Edible Olive Oil Into the United States During December

PEANUTS

Countries	Shelled		Not shelled		Peanut oil	
	Pounds	Dollars	Pounds	Dollars	Pounds	Dollars
France	.....	.....	.....	....	110,346	11,647
Germany	89,469	7,345	.....	....	.....	.....
Netherlands	.....	.....	.....	....	17,567	2,082
Spain	.....	.....	10,913	919	.....	.....
Canada	4,800	420	.....	....	.....	.....
D. W. Indies	.....	.....	770	48	.....	.....
China	43,100	3,073	50,120	1,924	3,960	480
Hongkong	2,880	316	7,020	875	124,026	14,194
Japan, including C....	200	13	11,600	772	.....	.....
Total	140,449	11,167	80,423	4,538	255,899	28,403

EDIBLE OLIVE OIL

Countries	In packages weighing less than 40 pounds		Other	
	Pounds	Dollars	Pounds	Dollars
France	70,097	17,239	176,138	38,273
Germany	30	11	366	70
Greece	.....	.....	8,134	1,454
Italy	1,892,186	380,253	506,659	108,316
Spain	144,341	27,051	853,114	174,224
Turkey in Europe	.....	.....	1,150	257
Canada	34	9	.....	.....
Cuba	38	9	.....	.....
Syria	83	6	240	39
Egypt	.....	.....	77,700	16,084
United Kingdom	7,950	1,712	.....	.....
Total	2,114,759	426,290	1,623,501	338,717

Refining Test Methods

(*Continued from page 76*)

ing the foots to be otherwise normal in all respects.

The lime soaps may be separated from the oil, if desired for further examination, by repeated precipitation from ethyl ether solution of the sample, in the cold; or from the insoluble material left after filtering and washing the diluted mixture of soaps obtained in the saponification of the sample with alcoholic potash, the alcohol first being evaporated off.

Normal commercial olive oil foots analyze with an ash content .05 to .18 per cent, moisture and impurities usually under 3 per cent, free fatty acids up to 75 per cent or more, saponification value 188 to 195, iodine value (Wijs) 78 to 92, and unsaponifiable matter 1.20 to 3.00 per cent.

RECENT ABSTRACTS

In order to make the Journal of greater use to its readers, the Abstracts Editor believes that instead of abstracting articles in other journals, it would be a better plan to simply gather and present the titles. Because there are too many articles of interest for them to be covered in the space available, the plan as proposed will permit of a greater coverage of the field. At the same time, the arrangement enables all who are interested in a particular subject to locate the original articles. Criticism of this policy is invited, as it is the policy of the journal to render service to its readers as far as it is within its power.

JOURNAL OF THE SOCIETY OF CHEMICAL INDUSTRY

(Dec. 24, 1926—Page 1019 et seq.)

Fat from Salvadora oleoides. Khakan fat.

Oil from Aleurites Trisperma.

Oil from Aleurites Species.

Origin and Detection of Rancidity in Fats and Oils.

Detection of Fish Oils.

PATENTS

Improving the durability of liquid vegetable oils. N. Bollman. (E.P. 260,108, 9.11.25; cf.G.P. 337,169 and E.P. 160,840; B 1921, 630 A; 1922 945 A.)

Separating and Obtaining the Constituents of Waste Fats and Oils. Continentale A.G.f. Chemie and R.Tern (E.P. 259,417, 1.12-25).

Revivifying Spent (oil) Filtering Materials (U.S.P. 1,598,967.) S. Hiller.

Saponification of Olive Oil—G. I. Finch and A. Karim—Society of Chemical Industry 469 T; Dec. 31, 1926.

JOURNAL OF THE SOCIETY OF CHEMICAL INDUSTRY

(Jan. 7. British Chemical Abstracts B. p. 18 et seq.)

Maize Oil.

Highly Unsaturated Acids of Japanese Sardine Oil.

Determination of Free Alkali in Soaps.

Animal Skin Fat.

Leather Japans.

Detergent Action of Soaps.

Patents

Method of Obtaining Scalp Treating Oils. E. P. Eliades (U.S.P. 1,602,004 –5.10.26).

JOURNAL OF THE SOCIETY OF CHEMICAL INDUSTRY

(Jan. 21, 1927)

Methods of Saponification in the Light of Modern Saponification Theory.

Acetin and Dichromate Methods for Glycerin Analysis.

Rate of Polymerization of Perilla Oil.

Iodine Value of Perilla Oil.

Tertiary Bromine-Iodine Values of Drying Oils.

Importance of Soya Bean Oil for Softening and Increasing the Stretch of Cola Vulcanized Rubber.

Patents

Extraction of Oils, Fats, Waxes, Greases and the Like. L. J. & A. Simon and Simon Bros. Engineers Ltd. (E.P. 255,923, 20.4.25 and 17.6.25).

INDUSTRIAL AND ENGINEERING CHEMISTRY

(Jan. 1, 1927)

Boiling of Linseed Oil. J. S. Long, C. A. Knauss, and J. G. Smull.

Chemistry of Chinese Wood Oil. F. H. Rhodes and C. J. Welz.

Susceptibility of Fats to Autoxidation. Geo. E. Holm, Geo. R. Greenbank and E. F. Deysher.

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